REMARKS

Claims 15, 31 and 46 have been cancelled. Claims 1, 16 and 32 have been amended to recite that the bleaching pulp mixture of mechanical pulp which is subjected to a bleaching step is at a pH of from about 5.0 to 8.5. Claims 12, 28 and 43 have been amended to recite that the bleaching pulp mixture of mechanical pulp which is subjected to a bleaching step is at a pH of from about 6.5 to about 8.0.

New claims 49-57 have been added. These new claims address preferred features of this invention. First, that the mechanical wood pulp is selected from a group consisting of stone groundwood (SGW), pressurized stone groundwood (PSGW), refiner mechanical (RMP) and thermomechanical pulp (TMP). Second, that the bleaching pulp mixture is formed in the absence of sodium silicate or in the absence of sodium hydroxide.

Claims 1-11, 13, 14, 16-27, 29, 30, 32-42, 44, 45, 47 and 48 are rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Fossum et al.

Fossum et al is directed to bleaching of semichemical pulp not mechanical pulp. The differences between mechanical and semichemical pulp are well known in the art. As stated in the first paragraph of the Prior Art section of the subject specification, mechanical pulps are produced from wood using mechanical means only. There are four mechanical pulping processes in use commercially: the stone groundwood (SGW), pressurized stone groundwood (PSGW), refiner mechanical (RMP) and thermomechanical pulp (TMP) pulping processes. The stone groundwood process and the pressurized stone groundwood process use wood bolts while the refiner mechanical and thermomechanical pulping processes use chips. The stone groundwood process is the leading process for mechanical pulping but is rapidly being replaced by the thermomechanical pulping process because there are distinct economies that arise from using chips rather than wood bolts, and the resultant thermomechanical pulp is inherently stronger. In

mechanical pulping, no active chemical, other than water, is used to facilitate fiber liberation. Virtually, all of the chemical constituents in the wood are retained in mechanical pulp, including lignin and other chromophores.

Fossum et al does not teach or suggest the bleaching of mechanical pulp. The requisite suggestion or teaching has instead been introduced by the Examiner not by the Fossum et al reference. All of the pending amended claims are directed to making a bleached mechanical pulp. Claims 49-51 address a mechanical wood pulp is selected from a group consisting of stone groundwood (SGW), pressurized stone groundwood (PSGW), refiner mechanical (RMP) and thermomechanical pulp (TMP).

The Examiner also argues that if semichemical pulp is not mechanical, which it isn't for the reasons set forth above and by Applicant in prior response to the Examiner's assertion, than the instant specification states that the process can be applied to other pulping processes can be used (see specification, page 14, lines 7-11). Applicants statement in the specification is not directed to semichemical pulp. Instead, it relates to mechanical pulps other than SGW, PSGW, RMP, and TMP. For example, it could be one of the other types of mechanical printing pulps mentioned in the TAPPI article cited by the Examiner, i.e., TRMP, PRMP or PPTMP.

As previously stated, Fossum et al specifies that chemical pulp to be bleached is immediately subjected to alkaline extraction to remove dissolved lignins. In mechanical pulps, extractions are not performed since they substantially reduce the ultimate yield of wood converted to paper. Contrarily, mechanical pulp yields are maintained as high as possible. Extraction is only performed as part of a bleaching sequence involving chemical pulps. It is not preformed on mechanical pulps as claimed by applicants. Applicant teaches bleaching mechanical pulp to maintain yields as high as possible and to correspondingly reduce costs. Chemical bleaching systems which work in the bleaching of chemical pulp do not necessarily work in the bleaching of mechanical pulp.

Fossum et al conducts it's bleaching sequence at a pH of up to 3. In the claims of the present invention the bleaching pulp mixture of mechanical pulp which is subjected to a bleaching step is at a pH of from about 5.0 to 8.5. Line 47, column 6 of Fossum et al, it describes magnesium salts as a complexing agent not as an alkali source as claimed by Applicants. In the claimed invention, magnesium hydroxide is employed as a replacement for caustic soda to activate the hydrogen peroxide according to following reaction scheme:

$$Mg(OH)_2 \Leftrightarrow Mg^{+2} + 2\ OH^-$$
$$HOOH + OH^- \Rightarrow H_2O + OOH^-$$

At pH of 3 or below, $Mg(OH)_2$ does not substantially exist. It is only present as a magnesium salt of the nondeleterious acid used. It has no alkalinity to activate the hydrogen peroxide as shown in the reactions above. Contrarily, in very acidic solutions, such as described in the Fossum et al reference, the following reaction occurs using a monovalent acid as an example:

$$Mg(OH)_2 + 2HX \text{ (where X = monovalent anion of nondeleterious acid)} \Rightarrow Mg\ X_2$$

A magnesium salt according to the teaching of Fossom, et al can only function as a complexing agent to preserve the viscosity in chemical pulps, not as an alkali source. Therefore, for $Mg(OH)_2$ to function as a peroxide activator, at a higher pH.

In Fossum et al, there are two purposes behind the magnesia addition. In column 5 of Fossum, et al, acid is added to lower the pH which improves the effectiveness of the complexing agents by placing all of the transition metals into solution. By raising the pH, the transition metals would remain complexed. At lines 55-65 of column 5 of Fossum, et al, the purpose of raising the pH is to extract the dissolvable lignin in the alkaline solution. This is contrary to Applicants' purpose and to the definition of mechanical pulps. Mechanical pulps are known as high yield pulps because the lignin is not extracted but remains with the pulp to generate more

pulp per unit of wood. For mechanical pulps, the yield is typically over 90% as compared to only 50%-60% for chemical pulps.

In the subject patent application, the purpose of the magnesia is not to raise pH but to react with the hydrogen peroxide to form the active perhydroxyl ions.

$Mg(OH)2 + 2\ HOOH \rightarrow 2\ HOO^- + Mg^{+2} + 2\ H2O$

By examining the charts and tables set forth in the specification, one will see that the magnesium hydroxide does not increase the pH.

In column 6, lines 47-55, of Fossum, et al, magnesium salts are used to inhibit decomposition of the cellulose. This is believe to happen by one of the following reactions:

a. Reacting the magnesium with the reactive hydrogen on the cellulose preventing degradation of the cellulose.

b. Reacting the magnesium with the transition metals (Mn,Fe,Cu) to form an insoluble metal complex preventing the transition metal from catalyzing the decomposition of the cellulose.

Contrarily, in the claims of the subject patent application, the purpose of the introduction of magnesia is to activate the peroxide for bleaching of mechanical pulp.

Claims 1-11, 13-27, 29-42 and 44-48 are rejected under 36 U.S.C. 103 (a) as being unpatentable over Fossum, et al in view of TAPPI Journal, page 232, Dec. 1987 or Gard.

Fossum, et al does not suggest or teach the invention of claims 1-11, 13-27, 29-42 and 44-48 for the reasons previously set forth above. Gard does not teach or suggest that peroxide and magnesium oxide or magnesium hydroxide can be alternatively used on either mechanical or chemical pulp.

Gard uses MgO as a standard only for purposes of measuring G-E brightness of pulp. Pure MgO is the "100" scale standard and carbon black is the "0" scale standard for brightness measurement using a General Electric reflectometer. MgO is not used in pulp bleaching in the process of Gard. Gard teaches conventional mechanical pulp bleaching using NaOH, not MgO or MgOH, to form an alkaline solution at a pH of 10.5 to 11. The reason for operating at this higher pH range, is that Gard uses MgO as a stabilizer not as a bleaching chemical. MgO is not employed by Gard as a true alkali source.

Gard first reduces pH to 4.0 -5.5 and adds a chelant. Acidifying the pulp first solubilizes the transition metal so that the chelant is more effective. In the next step, caustic soda, not magnesium hydroxide, and sodium silicate are added to activate the peroxide for bleaching at pH 10-11. In the subject claims, a reaction is being conducted between the magnesia and peroxide at a final pH of 5 to 8.5 and not at 10.5-11 as Gard teaches. Applicants do not claim the use of sodium silicate, but contrarily eliminate it's use which substantially reduces scaling and anionic trash.

The TAPPI article distinguishes pure mechanical pulp from chemimechanical pulp. The term mechanical pulp as employed by Applicants has been described in the specification of the present patent application and is distinguishable from chemimechanical pulp.

Claims 1-14, 16-30, 32-45, 47 and 48 are rejected under 35 U.S.C. 102 (b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Lindahl.

Lindahl teaches providing a slurry of mechanical pulp, and combining the mechanical pulp with a spent hydrogen peroxide bleaching agent and chelating agent. The actual bleaching pH in Lindahl is 10-11, not 7-9. The pH which the Examiner refers to in the Office Action is the pH of the spent liquor. The pH values set forth in the claims of the present invention are for the bleaching pulp mixture. In Lindahl, column 3, line 66, the pH after the addition to the pulp is disclosed as 9.8 to 10.8.

The Examiner has cited Lindahl for the proposition that $Mg(OH)_2$ is being used as an alkali. In Lindahl, $Mg(OH)_2$ is not being employed as an alkali source but instead is being used as a stabilizer. This is evidenced by the fact that the amounts of $Mg(OH)_2$ actually being employed in Lindahl is only 0.05% to 0.1%. In order to be effective as an alkali source in bleaching of mechanical, as claimed by Applicants, the amount of $Mg(OH)_2$ must be significantly higher. Also, adding insufficient $Mg(OH)_2$ to the peroxide for bleaching purposes will result in a substantially reduced level of brightness.

In dependent claims 9, 10, 14, 26, 30, 40, 41 and 45, for example, the significantly higher initial concentration of $Mg(OH)_2$, and the significantly higher initial ratio of the magnesium compound to hydrogen peroxide in the bleaching mixture, as compared to the teachings of Lindahl, can be clearly observed. Regarding Lindahl, in column 3, lines 4 thru 15, the $Mg(OH)_2$ is being employed as a stabilizer in the amounts of 0.01% to 0.05% by weight. Applicants are adding $Mg(OH)_2$ as an alkali source at levels 10 to 100 times greater because the HOOH used in bleaching the mechanical pulp demands it. For purposes of illustration, claim 14 describes that 0.25% to 0.75% $Mg(OH)_2$ is added to every 1% HOOH. This level of $Mg(OH)_2$ addition is done for a number of reasons such as to optimize brightness, as well as to produce residual peroxide.

Claims 15, 31 and 46 are rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as being obvious over Lindahl. Claims 15, 31 and 46 are rejected under 35 U.S.C. 112 second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. This rejection has been rendered moot because claims 15, 31 and 46 have been cancelled.

In summary, for the reasons set forth above, the applicable cited references, individually or in combination, do not teach or suggest the process set forth in pending claims 1-14, 16-30, 32-45, and 49-54 of the above-captioned invention.

Accordingly, this application is now in condition for allowance, and the Examiner is requested to pass this application to issue forthwith. If any matters are later deemed unresolved by the Examiner, he is encouraged to call the Attorney for Applicants to discuss same.

Respectfully submitted,

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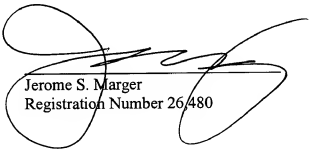

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VERSION WITH MARKINGS TO SHOW CHANGES MADE

1. (Amended) A process of making a bleached mechanical wood pulp comprising:

providing an aqueous slurry of mechanical wood pulp;

combining the mechanical wood pulp with a bleaching mixture comprising hydrogen peroxide and a magnesium compound selected from the group consisting of magnesium hydroxide, magnesium oxide and mixtures thereof, to form a bleaching pulp mixture, the bleaching pulp mixture being at a pH of from about 5.0 to 8.5; and

[maintaining] bleaching the bleaching pulp mixture [at a pH of 8.5 or less] for a time sufficient to produce the bleached mechanical wood pulp.

12. (Amended) A process according to claim 1, wherein the bleaching pulp mixture has a final pH of about [5.0] 6.5 to about [8.5] 8.0.

Cancel claim 15.

16. (Amended) A process of making a bleached mechanical wood pulp comprising:

providing an aqueous slurry of mechanical wood pulp;

adding a first chelating agent to said mechanical wood pulp;

providing a bleaching mixture comprising hydrogen peroxide and a magnesium compound selected from the group consisting of magnesium hydroxide, magnesium oxide and mixtures thereof, the bleaching pulp mixture being at a pH of from about 5.0 to 8.5;

washing the mechanical wood pulp, and optionally dewatering the slurry to for a washed mechanical wood pulp;

combining the washed mechanical wood pulp with said bleaching mixture; and

[maintaining] bleaching the bleaching pulp mixture [at a pH of 8.5 or less] for a time sufficient to produce the bleached mechanical wood pulp.

28. (Amended) A process according to claim 16, wherein the bleaching pulp mixture has a final pH of about [5.0] 6.5 to about [8.5] 8.0.

Cancel claim 31

32. (Amended) A process of making a bleached mechanical wood pulp comprising:

providing an aqueous slurry of mechanical wood pulp;

combining the mechanical wood pulp with a bleaching mixture comprising hydrogen peroxide and a magnesium compound selected from the group consisting of magnesium hydroxide, magnesium oxide and mixtures thereof, and with a recycled filtrate residual hydrogen peroxide, optionally, fresh hydrogen peroxide, to form a bleaching pulp mixture, the bleaching pulp mixture being at a pH of from about 5.0 to 8.5;

[maintaining] bleaching the bleaching pulp mixture [at a pH of 8.5 or less] for a time sufficient to produce the bleached mechanical wood pulp;

separating the bleached mechanical wood pulp from a filtrate comprising water and residual hydrogen peroxide; and

recycling at least a portion of said filtrate as at least a portion of said bleaching mixture.

43. (Amended) A process according to claim 32, wherein the bleaching pulp mixture has a final pH of about [5.0] 6.5 to about [8.5] 8.0.

Cancel Claim 46.

New claims 49-57 have been added.

--49. (New) A process according to claim 1, wherein the mechanical wood pulp is selected from a group consisting of stone groundwood (SGW), pressurized stone groundwood (PSGW), refiner mechanical (RMP) and thermomechanical pulp (TMP).

50. (New) A process according to claim 16, wherein the mechanical wood pulp is selected from a group consisting of stone groundwood (SGW), pressurized stone groundwood (PSGW), refiner mechanical (RMP) and thermomechanical pulp (TMP).

51. (New) A process according to claim 16, wherein the mechanical wood pulp is selected from a group consisting of stone groundwood (SGW), pressurized stone groundwood (PSGW), refiner mechanical (RMP) and thermomechanical pulp (TMP).

52. (New) A process according to claim 1, wherein bleaching pulp mixture is formed in the absence of sodium silicate.

53. (New) A process according to claim 16, wherein bleaching pulp mixture is formed in the absence of sodium silicate.

55. (New) A process according to claim 32, wherein bleaching pulp mixture is formed in the absence of sodium silicate.

55. (New) A process according to claim 1, wherein bleaching pulp mixture is formed in the absence of sodium hydroxide.

56. (New) A process according to claim 16, wherein bleaching pulp mixture is formed in the absence of sodium hydroxide.

57. (New) A process according to claim 32, wherein bleaching pulp mixture is formed in the absence of sodium hydroxide.--